

A BRIEF
TREATISE
OF THE USE
OF THE
GLOBE

Containing and Teaching

WHEREIN

Is set down the Principles of the
MATHEMATICS for all Tradesmen
Navigators, and all others that use
the Knowledge of the

GLOBE

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A BRIEF
TREATISE
OF THE
CLOSE

(The first and second parts)
BY
JAMES DOUGLAS
MATHAMATICS, &c. &c. &c.
AND ALL OTHERS
OF THE
ART

By J. D.
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TO THE READER

THE PREFACE TO
THE READER.



Doe here present thee (gentle Reader) with a briefe collection of the Use of the GLOBE, which may serve for an Introduction to young Students in the Mathematicks, requiring thee to accept thereof: For I doubt not but it will be very good for the furtherance of Travellers in the Art of Navigation: and to all others that are desirous of the knowledge of the beautifull frame of the celestiaall Orbs, with their Quantities, Distances, Courses, and marvellous motions of the Globes of the Sunne, Moone, Planets and fixed Starres. If therefore this my labour shall be gratefully accepted, as I doubt not but it shall, if thou

TO THE READER,

please justly to censure thereof: I shall bee incou-
raged hereafter to set forth a Worke of more worth:
So I referre my selfe to your favourable judge-
ments and curtesies, committing thee to the
Sacred tuition of him that ruleth all.

Farewell.

THE READER.

Thine in all Affection,

R. T.



INTRO:

INTRODUCTION
TO
ASTRONOMY.

Definitions of the Globe.



The Globe is a perfect round body, contained under one plaine: In the middle thereof there is a point called Center, from whence all lines drawne to the out-side are of like length, and called Semidiameters.

The Axes of the Globe is a Diameter, about which it moveth; and the ends thereof are called the Poles of the Globe.

In this respect the frame of the Heavens is called the Globe of the heavens, and the earth his Center.

The Axes is a line imagined, passing by the Center of the Earth to the Heavens, and the ends thereof is called the Poles, which are two points imagined in the heavens, whereof the one is called the North pole, and the other the South pole.

Of the Circles of the Globe.

Circles of the Globe are certaine imaginary Lines,

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and are termed either lesser, or greater Circles.

Greater Circles, are such as divide the Globe into two equall parts.

Lesser, are such as divide the Globe into unequall parts.

Greater Circles of the Globe in common accounts are sixe in number, viz.

The {	Horizon.		Zodiack.
	Meridian.		and
	Equinoctiall.		Two Collures.

Lesser Circles in common account, are foure in number, viz.

The {	Two Tropicks.
	Two poler Circles.

The Horizon, divideth that part of the heavens we doe see, from that part we see not, and is that Circle; where standing in a plaine field, and looking about, you would imagine the Earth and Heavens doe meet together, and cannot be perfectly discerned but at Sea.

The Axes of the Horizon, is an imagined line, passing by the Center of the earth to the heavens, and the ends thereof are called the poles, *Zenith* and *Nadir*.

The *Zenith* is the Point direct over our heads, and the *Nadir* direct under our feet.

As a man moveth himselfe any way, so is altered the Horizon.

The Meridian cutteth the Horizon at right Spherical angles, and passeth by the Poles of heaven, and by the *Zenith* and *Nadir*, and is that Circle wherein the *Sun* is at noone, and at midnight: It divideth the Globe into two equall parts by East and West, whose axis is a line

line passing by the Center of the earth to the heavens, and the ends thereof the Poles; which are the two points of the intersection of the East and West.

Any man moving directly North and South, keepeth the same Meridian: but going East or West, hee altereth the same.

The Equinoctial cutteth the Meridian at right sphericall Angles, and lyeth equidistant betwixt each Poles, and divideth the Globe into two equall parts, by North and South parts; to which Circle when the Sun commeth under it, it maketh the Day and Night of like length to all people in the world, except under the Poles; and the Sun commeth under this Circle two dayes in the year, viz. The 11th. of March, and on the 14th. of September.

The Axes and Poles whereof, are the axes and poles of Heaven.

The Zodiack is a great Circle; having in breadth 12. Degrees, which breadth is limited for the wandering of Planets, upon which Circle are the 12. Sines placed, which are twelve Constellations.

A Constellation is any certain number of Starres, gathered together into one forme by the ancient Astronomers, who have given them names, whereby they are knowne to all Christendome: which Sines have certaine Characters given unto them, and are these following:

1 March.

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1	March	♈	1	Aries	♈
2	April	♉	2	Taurus	♉
3	May	♊	3	Gemini	♊
4	June	♋	4	Cancer	♋
5	July	♌	5	Leo	♌
6	August	♍	6	Virgo	♍
<hr/>					
7	September	♎	7	Libra	♎
8	October	♏	8	Scorpio	♏
9	November	♐	9	Sagittarius	♐
10	December	♑	10	Capricornus	♑
11	January	♒	11	Aquarius	♒
12	February	♓	12	Pisces	♓

The first sixe are called Northerne lines, for that they are placed upon the North side of the Equinoſtiall; and the laſt ſixe are called Southerne lines, for that they are placed upon the South ſide of the Equinoſtiall.

In the middle of the Zodiack is a line called the Ecliptick, from which line the center of the Sun never ſwarveth, and this line cutteth the Equinoſtiall at oblique angles, and ſwarveth from it 23 Degrees 30 minutes: Which line when the Sun and Moone are in a diameter, that is; oppoſite, then is the Moone eclipsed; that is, darkned by the ſhadow of the Earth, the earth being betwixt the Sun and the Moone.

And when the Sun and Moone are both under the line in a ſemidiameter, then is the Sun eclipsed; the Moone being interpoſed betwixt our ſight and the Sun: This line Ecliptick is deſcribed upon the Globe for the whole Zodiack, whoſe axes is a line paſſing by the Center of the earth to the heavens, and the ends thereof are his Poles, which are two points ſo farre diſtant from the poles

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poles of the world, as the *Sun* his greatest distance from the Equinoctiall, viz. 23 degrees 30 minutes.

The two Collures are two Meridians cutting the Equinoctiall and the Ecliptick into foure equall parts, the one passing by the first point of *Aries* and *Libra*, and is called the Equinoctiall collure. The other passing by the first point of *Cancer* and *Capricorne*, and is called the Solstitiall collure: These two Circles doe divide the yeare in foure equall parts, viz. Spring-time, Sommer, Harvest, and Winter.

1	♈	} Spring-time.	7	♋	} Harvest.
2	♈		8	♋	
3	♈		9	♋	
4	♈	} Sommer.	10	♋	} Winter.
5	♈		11	♋	
6	♈		12	♋	

The meaning whereof is thus: From that time the *Sun* entereth into *Aries*, till it enter into *Cancer*, is called Spring time, and so of the rest, so that it is the passage of the *Sunne* in the signes, that causeth the alteration or the reason, and the *Sunne* passeth throughout the whole signes in one yeere, viz. in 365 dayes and 6 houres neare.

Of the lesser Circles.

The Tropicke of *Cancer* is a Circle parallel to the Equinoctiall 23 degrees 30 minutes distant from it Northward, and is that Circle under which the Center of the *Sunne* maketh her diagonall arch, when she is in the first point of *Cancer*, which is to us that have Northern Latitude, the longest day in the yeere being the 22 of June.

The Tropicke of *Capricorne* is a Circle parallel to the Equinoctiall, so farre to the Southward, as the Tropicke of *Cancer* is Northward, viz. 23 degrees 30 minutes, and is the Circle under which the Center of the *Sunne* maketh her diagonall arch, when she is in the first point of *Capricorne*, which to us that have Northern Latitude, is the shortest day in winter, viz. the 12 or 13 of *December*. These two Circles are termed the limits of the *Sunnes* progresse: for betweene these two Circles the *Sunne* hath his continuall course, and never exceedeth beyond any of them.

The Circle arcticke is a Circle parallel to the Equinoctiall, so farre distant from the North pole, as the Tropicke of *Cancer* is from the Equinoctiall, viz. 23 deg. 30 minutes.

The Circle antarcticke is a Circle parallel to the Equinoctiall so farre distant from the South pole, as the Tropicke of *Capricorne* is from the Equinoctiall, viz. 23 degrees 30 minutes.

Now you must understand, there is but one Equinoctiall, one Zodiacke, one Eclipticke, two Coltures.

But there are divers Meridians, all which meet in the two Poles of the world, and cut the Equinoctiall at right angles, and are so many in number as there can be points imagined in the Equinoctiall.

There are divers Horizons: for the Horizon altereth to any man, according as he moveth himselfe from his place of being.

There are divers Parallels, so called for that they are parallel to the Equinoctiall, and so many in number, as there can be points imagined in the Meridian.

Besides these Circles before mentioned, there are four other

other kind of Circles of great use, viz. Azimuth and Almucantars, Circles of Longitude and Latitude. Azimuths are great Circles, and meet all in the Zenith and Nadir, and cut the Horizon at right angles, and are numbred in the Horizon.

Almucantars are lesser Circles parallel to the Horizon, as the parallels are to the Equinoctial, and are numbred from the Horizon towards the Zenith.

Circles of Longitude, are great Circles meeting all in the poles of the Ecliptick, and cut the Ecliptick at right angles, and are numbred in the Ecliptick.

Circles of Latitude, are lesser Circles parallel to the Ecliptick, as the parallels are to the Equinoctial, and are numbred from the Ecliptick, to the poles of the Ecliptick.

Every Circle of the Globe is imagined to be divided into 360 degrees, and every degree into 60 minutes, every minute into 60 seconds, and so tell the tenth for the precision, for that a degree in the heavens is a large space.

In every great Circle the degrees are equal one to another.

In every lesser Circle they are equal in the same Circle, but unequal to those of another Circle, according as they grow nearer the Poles.

There belongeth to the furnishing of a Globe two other things, that is, an Houre circle, with an Index and a quadrant of Altitude.

The houre Circle is of Brass, divided into 24 houres by 12, and is to be placed upon the Meridian, upon the Pole elevated parallel to the Equinoctial.

The Index is a little ruler to be put upon the Pole.

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The Quadrant of Altitude is a bowed ruler of Brasse, divided into 90 degrees, equall to the degrees of the Globe, and hath a joynt to fasten the same upon the Meridian, and is alwayes to be placed upon the Zenith.

For the practice of Astronomic and Cosmographie, there are two Globes made, the one in the heavens, which is called the **Celestiall Globe**, and the other of the Earth, which is called the **Terrestriall Globe**.

Vpon the Celestiall Globe are pictured all the Starres upon the Convexitie thereof, as we behold them in the Heavens, in the Concavity thereof in forme and distance.

Vpon the Globe of the Earth is set Sea and Land, making one perfect body, all the known parts being laid down in forme, proportion, and distance by scale according to the proportion of the Earth.

Of the superficies of the Celestiall Globe.

TO the intent that the knowledge of Starres might be brought into rule and memory of men, therefore the ancient Astronomers gathered them together into certain constellations, and gave them names, whereby they are known unto all the world, that have the knowledge of Letters.

A Constellation is a certaine number of Starres gathered together in one forme, and so retain their names, whereby they are particularly knowne, and are in number according to the ancient account, 48; and are divided into three parts, *viz.*

Northern Zodiacke Southernne	}	Constellations	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
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The Northern Constellations are 31, viz.

1 <i>Ursa minor</i> , 7	12 <i>Hydra</i> , 14
2 <i>Ursa major</i> , 37	13 <i>Serpentarius</i> , 34
3 <i>Draco</i> , 31	14 <i>Serpens</i> , 18
4 <i>Cepheus</i> , 11	15 <i>Sitarius</i> , 5
5 <i>Bootes or Phosphorus</i> , 33	16 <i>Aquarius</i> , 9
6 <i>Carina</i> , 18	17 <i>Dolphin</i> , 11
7 <i>Eridanus</i> , 20	18 <i>Equuleus</i> , 11
8 <i>Lyra</i> , 10	19 <i>Pegasus</i> , 10
9 <i>Orion</i> , 27	20 <i>Andromeda</i> , 23
10 <i>Colossus</i> , 13	21 <i>Triangulum</i> , 4
11 <i>Perseus</i> , 16	

Zodiac Constellations are 12, viz.

1 <i>Aries</i> , 13	7 <i>Libra</i> , 13
2 <i>Taurus</i> , 32	8 <i>Scorpius</i> , 30
3 <i>Gemini</i> , 18	9 <i>Sagittarius</i> , 31
4 <i>Cancer</i> , 9	10 <i>Capricornus</i> , 28
5 <i>Leo</i> , 37	11 <i>Aquarius</i> , 13
6 <i>Virgo</i> , 26	12 <i>Pisces</i> , 10

Southern Constellations are 15, viz.

1 <i>Cetus</i> , 33	9 <i>Crater</i> , 7
2 <i>Orion</i> , 31	10 <i>Corvus</i> , 7
3 <i>Flumen Eridani</i> , 34	11 <i>Centaurus</i> , 37
4 <i>Lupus</i> , 11	12 <i>Fera aut Lupus</i> , 19
5 <i>Canis major</i> , 18	13 <i>Ara</i> , 7
6 <i>Canis minor vel Antares</i> , 14	14 <i>Corvus austr. vel Antares</i> , 13
7 <i>Argonau</i> , 15	15 <i>Piscis australis</i> , 18
8 <i>Hydra</i> , 25	

Beides

Upon each Globe there is a Table set down in what forme every Star of any bignesse is made, whereby you may readily know any starre in any Constellation of what bignesse it is.

And thus much in briebe for the superficies of the Globe of the Heavens.



Terrestriall Globe.



Upon the Globe of the Earth is set the picture of the earth, Land, and Sea; making one perfect round body; and as the Circles (before mentioned) are imagined in the Heavens, so part of them are imagined and drawne upon the Globe of the earth; as the Equinoctiall, the Meridians and Parallels.

The Globe of the Earth is first generall, divided into five parts, called five Zones: That is, one burnt, two temperate, and two frozen or cold Zones.

The distance betwixt the two Tropicks, is called the burnt Zone.

The distance from the tropick of *Cancer* to the circle Arctick, is called the temperate Zone Northward.

The distance from the tropick of *Capricornus* to the circle Antarctick, is called the temperate Zone Southward.

The space of the Earth contained within the two polar Circles, is termed the two frozen Zones.

The

1st The Earth is reckoned by Longitude and Latitude. Longitude is numbred in the Equinoctial by Meridians from the generall Meridian, into the East, and containeth the whole compasse of the Earth, viz. 360 Degrees.

The fixed Meridian is that Meridian that passeth by the Island of *Azores*, according to the ancient Cosmographers: yet the same may be placed in any other place at pleasure.

Thereasons why they did there begin to reckon the Longitude, were two.

First, for that at that time there was no Land knowne to the Westward in that place.

The second was, for that under the Meridian the Needle had no variation, but did point directly North and South.

The Latitude is reckoned from the Equinoctial towards either Pole, and is double, that is, Northerne and Southerne Latitude.

Those are said to have Northerne Latitude, that dwell on the North side of the Equinoctial, and contrary those are said to have Southerne Latitude that dwell on the South side of the Equinoctial.

The Globe of the Earth is divided into five Zones: That is, one burnt, two

The Earth is divided into four parts. viz. *Europe*, *Asia*, *Africa*, and *America*.

Europe is bounded from *Asia* by the mid-land Sea, and *Mare Mauritania*; by the marches called *Palus*, *Arctica*, and by the River *Tanis* and *Orontes*.

The space of the Earth contained within the two frozen Zones.

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13

The Provinces are these.

- | | |
|-------------|-----------------|
| 1 Germanie. | 7 Swedeland. |
| 2 Italy. | 8 Muscovia. |
| 3 France. | 9 Polonia. |
| 4 Spayne. | 10 Hungaria. |
| 5 Denmarke. | 11 Clavonia and |
| 6 Norway. | 12 Grecia. |

The principall Ilands.

- | | |
|-------------|--------------|
| 1 England. | 5 Candia. |
| 2 Scotland. | 6 Corsica. |
| 3 Ireland. | 7 Sardigna. |
| 4 Sicilia. | 8 Negropont. |

Asia is bounded from Europe by the River Tanis and Dwiana, from Africke by the narrow necke of Land betwixt the red Sea, and the mid-land Sea.

The Provinces are.

- | | |
|---------|--------------------------|
| China | Part of Mesopotamia, and |
| Persia. | Tartaria. |

In this part of the world was Paradise and the Land of promise.

Africa is bounded with the mid-land Sea and the red Sea.

Provinces.

- | | |
|-------------|-----------------|
| 1 Egypt. | 4 Nubia. |
| 2 Barbaria. | 5 Abasinet. |
| 3 Ethiopia. | 6 Alenomotopia. |

Ilands.

- | | |
|------------------------------|----------------------|
| 1 Madagascar, or S. Lorenzo. | 4 Insule de Canaria. |
| 2 S. Thome. | 5 Insule de Madaga. |
| 3 Insule de Carovord. | |

C

America

America is wholly bounded by the Sea and the straight of Magellann, and consisteth in two parts, viz.

Parvana.

Mexicana.

Parvana consisteth in these Provinces.

- 1 *Brasilis.*
- 2 *Tisnada.*
- 3 *Caribana.*
- 4 *Caragena.*
- 5 *Poru.*

- 6 *Chares.*
- 7 *Chile.*
- 8 *Chicha, and*
- 9 *Pmagones.*

Mexicana consisteth in these Provinces

- 1 *Nova Hispania.*
- 2 *Terra Florida.*
- 3 *Nova Albion.*
- 4 *California.*

- 5 *Norumbega.*
- 6 *Nova Francia.*
- 7 *Esotilant.*

Parvana chiefe Ilands.

- 1 *Hispaniola.*
- 2 *Cuba, with all the other Ilands of the West India.*
- 3 *Margaritis Insule.*
- 4 *Molueque Insule.*
- 5 *Rymores Insule.*

- 6 *Javawajer.*
- 7 *Javaminor.*
- 8 *Salomonis Insule.*
- 9 *All the other Ilands of East India.*

Mexicana chiefe Ilands.

- 1 *Greeneland.*
- 2 *Island.*
- 3 *Freeseiland.*

The names of the Seas,

- 1 *Ocean Sea.*
- 2 *Narrow Sea.*
- 3 *Mediterranean Sea.*
- 4 *Mare Adajor.*
- 5 *Caspium mare.*

- 6 *East Indian Sea.*
- 7 *Red Sea.*
- 8 *Persian Sea.*
- 9 *South Sea.*

And thus much in briefe for the superficies of the
Terrestrial Globe.

You

You must understand that the Ecliptick is described upon the Terrestiall Globe as well as upon the Celestiall; because that all the conclusions of the *Sunne* are as well wrought upon the Terrestiall Globe, as by the Celestiall, and the same furniture is to be fitted upon the Terrestiall Globe, that belongeth to the Celestiall: and thus much in brieft for their formes.

Now followeth their use: first of the Celestiall, and next of the Terrestiall.

FIRST PROPOSITION OF THE CELESTIALL GLOBE.

The day of the Moneth being given, to find the place of the Sunne.

VPon the Horizon of the Globe is graduated the Theoricke of the *Sunne*, that is, there is placed the moneths, and their dayes, the signes and their degrees. Therefore find the day of the moneth, and right against the same you shall finde the signe and degree that the *Sunne* possesseth.

Proposition 2.

The place of the Sunne being given, to finde the day of the Moneth.

Find the place of the *Sunne* in the Horizon, and against the same you shall finde the day of the moneth.

Prop. 3 *The place of the Sunne being given, to finde the Declination.*

BRing the place of the *Sunne* to the Meridian of the Globe, and the portion of the Meridian included be-

twixt the place of the *Sunne* and the Equinoctiall, sheweth the Declination.

Prop. 4. *The place of the Sunne and the Meridian height of the Sunne being given, to find the height of the Pole.*

BRing the place of the *Sunne* to the Meridian of the Globe, and from that point account downwards to the Horizon the height of the *Sunne*, and let the ends thereof end in the Horizon: then in the opposite part, you shall find cut on the Meridian the height of the Pole, that is, the portion of the Meridian included betwixt the Pole and Horizon, sheweth the height of the Pole.

Prop. 5. *To rectifie the Globe fit for use, the elevation of the Pole being known.*

SEt the Poles answerable to the Poles of Heaven.

Prop. 6. *To rectifie the quadrant of Altitude.*

SEt the joynt thereof upon the Meridian so far distant from the Equinoctiall as the Pole is elevated above the Horizon, that is, place the joint in the Zenith.

Prop. 7. *To rectifie the Index of the hours Circle, for any day appointed.*

BRing the place of the *Sunne* to the Meridian of the Globe, and then put the Index upon 12 of the clock, or upon that 12, which is uppermost from the Horizon.

Prop. 8.

Prop. 8. *The elevation of the Pole and place of the Sunne being given, to find the Meridian, height of the Sunne.*

THe Globe rectified, bring the place of the Sunne to the Meridian, and the degrees from the place of the Sunne to the Horizon, shew the demand.

Prop. 9. *The elevation of the Pole and place of the Sunne being given, to find the houre of the Sun rising.*

THe Globe and Index of the houre Circle being rectified, bring the place of the Sunne to the East side of the Horizon, and the Index of the houre Circle sheweth the houre of the Sunne rising.

Prop. 10. *The elevation of the Pole and place of the Sun being given, to finde the houre of the Sun setting.*

THe Globe and Index of the houre Circle being rectified, bring the place of the Sun to the West side of the Globe, and the Index of the houre Circle sheweth the houre of the Sunnes setting.

Prop. 11. *The elevation of the Pole and place of the Sun being given, to find the length of the day.*

Find the houre of the Sun setting by the last Proposition, and double that time, so have you the length of the Day.

Prop. 12. *The elevation of the Pole and place of the Sun being given, to find the Amplitude.*

THe Globe rectified, bring the place of the Sun to the Horizon, and the portion of the Horizon included betwixt the place of the Sunne, and the point of East or West, sheweth the Amplitude.

Prop. 13. The place of the Sunne and Amplitude being given, to finde the height of the Pole.

Turne the Globe and move the Meridian untill you have fitted the place of the Sunne in the point of the Amplitude, and then the Pole of the Globe sheweth the height of the Pole, that is, the place included betwixt the Pole of the Globe and the Horizon, sheweth in the Meridian the height thereof.

Prop. 14. The place of the Sun being given, to finde the right ascension thereof.

Bring the place of the Summe to the Meridian, and the degree cut by the Meridian in the Equinoctiall sheweth the right Ascension.

Prop. 15. The elevation of the Pole and place of the Sun being given, to find the crooked Ascension.

THe Globe rectified, bring the place of the Sun to the East side of the Globe, and the degree cut by the Horizon in the Equinoctiall, sheweth the crooked Ascension.

Prop. 16. To find the difference of Ascension.

First find the right, and then the crooked Ascension: then take the lesser from the greater, and that rest sheweth the difference of Ascension; except that remainder do exceed 180 degrees, and then that rest taken from 360 degrees, sheweth the difference of Ascension.

Prop. 17. By the difference of Ascension, to find the length of the day.

Double the difference of Ascension, and reduce that into time, by allowing 15 degrees to an hour, and

and foure minutes to a degree, and that sheweth the length of the day, longer or shorter then an Equinoctiall day: if the Sunne have declination towards the Pole Elevated, then is it longer then the Equinoctiall day, but otherwise is shorter.

The Equinoctiall day is 12 houres,

Prop. 18. The Elevation of the Pole, and declination of the Sunne being known, and the height of the Sunne being taken, to find the houre of the day and Azimuth of the Sunne.

THE Globe Index of the houre Circle, and Quadrant of Altitude being rectified, turne the Globe, and move the Quadrant of Altitude, untill you have fitted the place of the Sunne in the Almicanthar, then doth the Index of the houre Circle shew the houre, and the quadrant of Altitude sheweth in the Horizon the Azimuth.

In this proposition you must consider whether it be in the forenoone or afternoone: if in the forenoone, put the Quadrant on the East side: and if in the afternoone, on the West side of the Globe.

Prop. 19. The height of the Sunne being given, to find the houre of the day.

THE Globe Index and the Quadrant of Altitude being rectified, bring the place of the Sunne, untill it cut the height given in the Quadrant of Altitude, and the Index in the houre Circle sheweth the houre:

Prop. 20. The houre of the day being given, to finde the height of the Sunne.

ALL things rectified, as in the last Proposition turne the Globe untill the Index cut the houre: then bring

bring the quadrant of Altitude over the place of the Sun and the degree cut on the quadrant of Altitude, sheweth the height of the Sun.

Prop. 21. *The Azimuth of the Sun being given, to find the Houre of the day, and height of the Sun.*

All things rectified, put the quadrant of Altitude to the Azimuth: then turne the Globe, untill the place of the Sun touch the edge of the Quadrant, then the Index of the houre Circle sheweth the houre, and the degree cut on the quadrant of altitude, sheweth the height of the Sun at that time.

Prop. 22. *The houre of the Day being given, to find the Azimuth of the Sun.*

All things rectified, turne the Index to the Houre: then bring the quadrant of altitude on the place of the Sun, and the end thereof in the Horizon sheweth the Azimuth.



Of the Starres.

Proposition, 1.

To find the Declination of any Starre.



Orke by the Starre, as you did by the Sunne in the 3. Proposition, viz. An example: *Arcturus* in *Bootes* leggs brought to the Meridian of the Globe, the portion of the Meridian betwixt the place and the Equinoctiall, sheweth his declination to the Northerne.

Prop. 2.

Prop. 2. The Meridian height of any Starre being given, to find the height of the Pole.

WOrke by the starre, as you did by the Sunne in the fourth Proposition viz. *Arcturus* Meridional height supposed to be given 60 deg. then the height of the Pole opposite is found to be 52 degrees.

Prop. 3. To find the hours of rising of any starre.

ALL things rectified, worke by the starre as by the Sunne in the 9 Proposition: for to know at any time the rising of *Arcturus*, or any other starre, you must know in what signe the Sunne is. As for example: The Sunne rising in the 10 degree of *Capricornus*, which being brought under the fixed Meridian and then the Globe and Index rectified, *Arcturus* is then found to rise at 6 hours and 30 minutes in the morning, and setten in the evening at hours 10. 30 minutes.

Prop. 4. To find the hours of any starre setting.

ALL things rectified worke by the starre as by the Sun in the 10 Proposition, or precedent demonstration.

Prop. 5. To find the time of any starre above the earth.

First find the hour of rising, and then the hour of setting: the difference of which time is the thing required.

Example.
Arcturus is found by the former Proposition to rise at hours 6. 30 which is 5. 30 before 12, and he setten at 10. 30: both which times added together, maketh 16 hours, and so is *Arcturus* found to be 16 hours above the earth.

Prop. 6. To find the time of any starre below the earth.

Example.
The same *Arcturus* is found by the former Proposition to rise at hours 6. 30 and to set at hours 10. 30: the difference of which times is 4 hours, and so is *Arcturus* found to be 4 hours below the earth.

Prop. 6. To find the Amplitude of any Starre.

WOrke as by the Sunne in the 12 Proposition. Example: *Arcturus* Amplitude is found then, when he is brought to the Horizon; in the side is 27 degrees of Amplitude.

Prop. 7. The Amplitude of any starre being given, to find the height of the Pole.

WOrke by the starre, as by the Sun in the 12 Proposition. Example: *Arcturus* Amplitude being given 27 degrees, the Pole of Heaven is found to be 52 degrees above the Horizon elevated.

Prop. 8. To find the right Ascension of any starre.

WOrke by the starre, as by the Sun in the 12 Proposition. Example: Bring *Arcturus* to the Meridian, and the point in the Equinoctiall being then under the Meridian, sheweth the right Ascension to be 209 deg.

Prop. 9. To find the crooked Ascension of any starre.

WOrke by the starre, as you did by the Sunne in the 15 Proposition. Example: The place of *Arcturus* being brought to the Horizon, the degrees of the Equinoctiall against the Horizon, do prove his crooked Ascension to be 178 degrees.

Prop. 10. To find the Declination of any starre.

Bring the Center of the Quadrant of Altitude, being taken from the Meridian, upon the Pole of the Celestiall vns. *Arcturus* Latitude is to be measured from the Pole Celestiall, with the Quadrant of Altitude, and is found to be 31 degrees 30 minutes, and his Longitude is 19 degrees of *Libra*, to be reckoned with the Quadrant of Altitude.

itude, being brought from the Pole Ecliptick; or Zodiacke, passing right on the place of *Mercurius*.

Compass in *Galicia* is by sundry matters found to be in the 43 parallel, which is in Latitude 43 deg. Northward, and in the 11 Meridian 30 minutes, which is in Longitude 211 degrees and a halfe.

Latitude or Altitude, beginneth from the Equinoctiall by parallels Northward or Southwards, to be reckoned to 90 degrees.

Longitude to be reckoned by Meridians numbered in the Equinoctiall, which is that Meridian passing between the Equinoctiall and the Pole of the *Equinoctiall*, and are numbered in the East round about the Globe, viz. to 360 degrees.

One houre containeth 15 degrees or 90 minutes, and 4 of those minutes containe one degree: therefore dividing still your number of minutes by 4, and the quotient shall be degrees.

Example.

Twelve minutes of an houre give three degrees of Longitude, which is 12 minutes, so that every minute of an houre time is $\frac{1}{15}$ part of one degree in Longitude, as is proved by the worke following.

Here followeth the 11 Proposition concerning the Starres.

The two Starres lying in the *Horizon* 14 rise on the *Meridian* 14 and the *Starre* 14 is the *Starre* 14. *Example.* The two Starres lying together, the one is the first starre in *Orions* girdle, and the other star is that which

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is in *Pegasus* nose: therefore turn the Globe until you fit the said two Starres equal with the Horizon in the East: then shall the portion betwixt the North Pole and that Horizon teach you the Poles height to be in 33 degrees.

Prop. 12. The place of the Sunne and the length of the day being given, to find the height of the Pole.

THe place of the Sunne given is in 17 degrees of *Libra*: and the length of the day given, is 11 houres. Therefore first find out the right Ascension of the Sun: then number from that place so many Meridians as doe containe the halfe length of the day given: and let the end of those degrees rest under the Meridian: then move the Meridian of the Globe, untill you fit the place of the Sunne in the Horizon, and then shall you find upon the Meridian the just height of the Pole.

For Example.

The Sunne being in 17 degrees of *Libra*, her right Ascension is found to be 195 degrees, the dayes length given is 11: therefore take the one halfe, that is 5. houres $\frac{1}{2}$: which time reduced in to degrees, *facit* 82 degrees 30 minutes, the which subtracted out of the Sunnes Ascension 195, there rest 112 degrees 30 minutes, which number finde out upon the Equinoctiall, and bring it to the fixed Meridian, and there keepe the same, untill by moving the Meridian you doe bring the 17 degree of *Libra* equal with the Horizon: that done, then will the height of the Pole be found elevated just 41 degrees.

Prop.

Prop. 13. *The length of the day and Amplitude of the Sun being given, to find the height of the Pole, and the Sunnes Declination.*

The length of the day given, is eleven houres. The Amplitude of the Sunne given, is 10 degrees. Therefore number from the first Meridian Westward, those degrees that have the length of the given day, reduced in degrees and yeeld; and let the end of those degrees begin in the Equinoctiall, rest under the fixed Meridian: then move the Globe untill you have fitted the first Meridian to cut in the Amplitude given, and then shall the Meridian of the Globe shew the just height of the Pole: *Examply.*

The length of the day given is 11 houres, whose halfe is 5½, the same reduced into degrees faith 28 degrees 30 minutes, the which taken out of 360 degrees, rest 377 degrees 30 minutes, the latter point whereof fix under the fixed Meridian, there holding the same untill by moving the fixed Meridian, you can bring the given Amplitude on the East side, to fit upon the first point of the Meridian: which done then shal you find the Pole elevated 51 degrees above the Horizon.

PROPOSITIONS THAT ARE RESOLVED UPON THE TERRESTRIALL GLOBE.

That all Propositions concerning the Sun, may as well be resolved upon the Terrestrial as the Celestiall Globe.

Prop. 1. *To find the Latitude of any place.*

Bring the place, whose Latitude is required, to the Meridian of the Globe, and the portion of the Meridian included between that place and the Equinoctiall, sheweth the Latitude.

And so are the following Places in Latitude Northward.

London.	51. 4. 30. m.	Ragusa.	42.
Hamborough.	54.	Cyprus.	37. 15.
Amsterdam.	52. full.	Rhodus.	38.
Antwerp.	51. scarce.	Jerusalem.	34. 40.
Belleigue.	48. 30.	Teneriffe.	28. 30.
Paris.	48. 30.	Capo blanco.	20.
Lyon.	46.	Isla. St. Heli.	16. 40. Southward.
Bordeaux.	43. 40.	Nombre de dieux.	9. Northward.
S. Ander.	42. 30.	diex.	1. Northward.
The Grapes.	41.	Pavania.	8.
Larbone.	39. 30.	Capo de Vela.	19.
Sevil.	37. 30.	Havana.	22.
Capo Martin.	39. 40.	San Domingo.	17. 30.
Genoa.	45.	Ile de la.	68.
Roma.	42.	Paso Insula.	64. 30.
Naples.	41.	Ilandia.	67. 30.
Palermo.	37. 30.	Gibraltar.	35.
Venice.	46.		

Prop. 2. To find the Longitude of any place.

Bring the place appointed to the Meridian of the Globe, and the degrees cut by the Meridian in the Equinoctial, sheweth the Longitude.

And so are the places hereunder found in Longitude, viz.

London.	10. 30. Longitude.	Lithane.	13.
Hamborough.	22. 30.	Sevil.	17. degrees.
Antwerp.	16. 40.	Genoa.	35.
Paris.	24.	Roma.	37.
Bordeaux.	22.	Venice.	40.
S. Ander.	18. 30.	Palermo.	37. 30.
The Grapes.	14.	Jerusalem.	60.
San Domingo.	13.	Teneriffe.	34. 40.
		Palma.	1. degree.

Prop. 3. To find the difference between any two places.

upon the Globe.

Take the distance with a paire of Compasses, and apply the same to the Equinoctiall, accounting for every degree 60 miles or 20 leagues, or according to that Country wherein you are.

And so are the distances betweene,

Tierusalem 39. facit 793 leagues.

Antwerp 3. 30. facit 70.

Paris 4. 10. facit 86.

Venice 13. 40. facit 279.

London 13. 40. facit 279.

and *Lisbona* 13. 7. facit 273.

Sevil 14. 1. facit 281.

Roma 16. 7. facit 330 leagues.

Teneriffe 27. 00. facit 540.

Terra nova 28. 00. facit 560.

Prop. 4. To find the Latitude and Longitude of any place being given, to find the same upon the Globe.

Bring the Latitude of that place to the Meridian of the Globe, and under the Meridian in the Latitude, shall the place required be found.

By the first and second Proposition is this Proposition resolved.

Prop. 5. To find the Antipodes to any Place.

Bring the place appointed to the Meridian, and note the Latitude, then in the opposite degree of Latitude under the Meridian you shall find the point of Antipodes.

And after this for example Antipodes to London, that dwell 51 degrees 7. Latitude, and in 12. 45. Longitude in the South-maine.

And

And to *Sevill*, those that dwell in 37 degrees, 30 min. Latitude, and 196 deg. Longitude are Antipodes.

And to *Lisbon*, those that dwell in 39 deg. 30 min. Latitude, and 191 deg. Longitude, are Antipodes.

And to *Antwerp*, those that dwell in 51 deg. Latitude, and 195 deg Longitude in the said South-main.

The people dwelling under the North and South Pole, and under the Eclipticke Poles, are Antipodes the one to the other.

Those of *Cusco* in *America*, are Antipodes to those of *Narsinga* in East India.

Those of *Lyma* and *Galicut*, are Antipodes to each other.

The *Insulanes* of *Serrana* and *Joao*, are Antipodes to each other.

Those of *Xalisco*, *Colima*, *Guatatan*, *Petratlan*, *Gua-xaca*, &c. are Antipodes to the *Insulanes* of *S. Laurence*.

Those of *Malaca* are Antipodes to that people dwelling in the Province of *Omagua*.

Prop. 6. To find the difference of time between any two places.

BRing the Eastermost place to the Meridian, and rectifie the Index : then bring the second place also to the Meridian, and marke where the Index cuts, it sheweth the hours at that second place, where it is none at the first. Or to do this more precisely, find the difference of the Longitude between these two places : which remainder reduce into time, by allowing 15 degrees for an hour, and the difference is found.

Propoⁿ. To find the Difference of the longest Day be-
tween any two places.

Find the length of the Day at each place by the Propo-
sition before taught, and the difference between them
is found by their severall lengths.

Example. It is to be noted, in Northern Latitude the long-
est Day of the year is when the Sun is in the first point of
Cancer, and therefore according to that place is the longest
day of severall places hereunder set downe, the which pre-
cisely have been calculated by the difference of Ascension
on that he is made at one same time in severall places.

London lying in the Latitude of 51 deg. 30 min. and
the place of the Sun taken in the first deg. of Cancer, had
right Ascension 9 deg. and crooked Ascension 58 deg.

Latitude 51:30 makes 10 deg. difference of
Ascension, which doubled is 20 deg. those reduced
into time, $20 \div 15 = 1$ hour 20 min. those added to 12, $12 + 1:20 =$
13 hours 40 minutes for the longest Day.

Latitude 49 deg. 30 min. has right Ascension 9 deg.
crooked 62, the difference is 53: which dou-
bled is 106, which make 7 hours 56 min. of time: those
added to 12 hours, make 19 hours 56 min. for the long-
est day.

Latitude 47, hath the same difference of Ascen-
tion of the Sun, and therefore their longest day is equall
with those of Genoa 14 hours 56 min.

Latitude 41 deg. right Ascension 90, crooked
124: 30, and the difference thereof is 34: 30 deg. 3 hours
54 min. which added, $12 + 3:54 =$ 15 hours 54 min.

Venice Latitude 45 deg. right Ascension 90, crooked
124: 30, and the difference thereof is 34: 30 deg. 3 hours
54 min. which added, $12 + 3:54 =$ 15 hours 54 min.

Candia Latitude 27 deg. in that place and on the same day make the Sun 18 degrees difference of Ascension: which doubled *facit* 36 which is 3 houres 24 min. of time: which added to 12 houres, *facit* 14 houres 24 min. for their longest day.

Rhodes in Latitude 38 deg. *facit* difference 19 deg. doubled 38, *facit* 2 houres 32 min. which added, make 14 24 houres 32 min. for their longest day.

At *Ierusalem* Latitude 34 deg. 40 min. when the Sun is in the first deg. of *Cancer*, he differeth in Ascension 17 deg. which doubled *facit* 34 deg. the which make of time 2 houres 16 min. which added to 12 houres, *facit* 14 houres 16 min. for the longest day.

In *Fowles* Hand in the Latitude of 28 deg. 30 min. in the same time the Sun doth differ in Ascension 12 deg. which doubled maketh 24 deg. which make of time one one houre 40 minutes: those added to 12 houres, *facit* 13 deg. 40 min. for the longest day.

Cape Blanco lying in 20 degrees Latitude, in the same time the Sun hath right Ascension 90 degrees, and crooked 42, rest 8 of difference, which doubled, *facit* 16 degrees, and of time one houre 4 minutes, which added to 12, *facit* 13 houres 4 minutes for the longest day.

Panama Islands 8 degrees Latitude, right Ascension 98 degrees, crooked 87 degrees, so is there difference 11 deg. which doubled makes 22 deg. and 24 min. of time, so is their longest day in the yeere 12 houres 24 minutes.

Southern Hands, situated under the line Equinoctiall there maketh the Sunne no difference of Ascension, and therefore the day is alwayes of 12 houres long, but winter or summer the Sun declineth North or Southward.

Cape de Vels in the West Indies in 10 degrees of Latitude

tude, at the same time when the Sunne is in the first degree of *Cancer*, hath 90 degrees right Ascension, and crooked 85, difference is 5, which doubled is 10 minutes, which reduced make 40 minutes of time, which added to 21 houres, sheweth their longest day to be 21 houres, 40 minutes.

Havana at the same time differeth the Sunne in Ascension 9 degrees 30 minutes, double makes 19, which is time one houre, 16 minutes, which added to 12, maketh 13 houres, 16 minutes for their longest day.

San Domingo Island maketh the Sunne 7 degrees: for difference of Ascension: which doubled, maketh 15: is one houre time, so is their longest day 13 houres.

Faire Island in 64 deg. of Latitude, the Sunne hath at the same time 90 deg. right Ascension, crooked 30, rest 60 for difference thereof, which doubled, *facit* 120 deg. which maketh time 8 houres, those added to 12 houres, sheweth that the longest day there is 20 houres.

At *Jesaria Island* in 66 deg. Latitude the Sunne being in the first degree of *Cancer*, hath 90 deg. right Ascension, crooked 20, which difference is 70: those doubled, maketh 140 deg. which is 9 houres 20 min. of time, so is their longest day in the yeere 21 houres 20 minutes.

Island in 67 deg. Latitude. on the same time hath crooked Ascension 8 deg. which taken from 90, differeth 82 deg. which doubled, are 164 deg. which reduced into time, do give 10^h. 56 min. and those added to the Equinoctial day, *facit* 22 houres 56 min. for the longest day in the yeer.

These differences of Ascension is more precisely found by projecting the figures, and then by scale and compasse, and yet more precisely by Arithmeticall calculation, by which the said difference and length of dayes are found.

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13. 48 d. 56 m. <i>Teneriffe</i> , 13. 37	13. 20 d. 48 m. <i>Havana</i> , 10. 6
13. 12 d. 56 m. <i>Cabo-blanc</i> , 9. 7	13. 3 d. 4 m. <i>San Domingo</i> , 7. 43
12. 11. <i>Nombr</i> de <i>dias</i> , 4	20. 44. 40. <i>Para</i> <i>India</i> , 65. 39
12. 28. <i>Panama</i> , 3. 30	22. 9 d. 20. <i>Leiti</i> <i>India</i> , 79. 12

12. — *San Thoma*, being under the Equinoctiall, the sun maketh no difference, and therefore alwaies 12. houres.

Prop. 8. To find the Horizontall position and difference betwixt any two places.

First, rectifie the Globe for that place, from the which you would know the Horizontall position and distance to the other place: bring also that first place to the Meridian of the Globe, then put the quadrant of Altitude on the Zenith, there let the Globe rest, then bring the quadrant of Altitude over the two places, and the degrees cut by the end of the quadrant in the Horizon, sheweth the Horizontall position; and the degree cut by the second place in the quadrant, account from the Center downwards, sheweth the distance.

For Example,

The bearing of *Jerusalem* to *London* is 50 degrees, accounted from the North point Westward, and the distance is 38 degt. 30 min. And from *Bahagha* to *Jerusalem* the bearing is 85 degrees, accounting from the South point Eastward, and the distance is as before.

Now to find the Rhombe, add the two Horizontall positions together, and the one half thereof sheweth the

From *Jerusalem* to *Aleppo*, the bearing is 69 degt. from the North point Westward, the distance is 43 degt. 7: and *Aleppo* beareth to *Jerusalem* 49 degrees from the North point Eastward.

Jerusalem to *Teneriffe*, beareth 77 degrees from the North

North point Westward; and *Tombes* *distance* 164 deg. accounting from the North point Eastwards; and the distance betwixt the two places is 154 degrees.

Ierusalem to *Rome*, beareth 87 degrees from the North point Westward; distance 241. *Rome* to *Ierusalem* 86 degrees from the South point Westwards.

Ierusalem to *Gibraltar*, beareth 74 degrees from the North point Westward; and the distance is 113 degrees; and *Gibraltar* to *Ierusalem* beareth 3 deg. from the North point Eastward.



OF THE WORLD.

THE World is divided into two parts; *viz* Elemental, and *Etheriall* part.

The first is subject to daily alterations, and containeth foure Elements; that is, the Earth, the Water, the Aire, and the Fire.

An Element is that, whereof any thing is compounded, and of it selfe not compounded; Of these foure Elements, any part of any kind is named for the whole; as any part of the earth, is called the Earth.

The *Etheriall* parts doth comprise the *Elementall* parts in the concavity thereof, and containeth 10 Spheres: whereof the first is the sphere of the *Moon*, and is next unto us. The second is *Mercurius*. The third, *Venus*: the fourth, *Sol*. The fifth, *Mars*: The sixth, *Iupiter*: The seventh, *Saturnus*: The eighth sphere is the *Starry firmament*. The ninth is the *Crystalline heaven*. The tenth, *Primum mobile*, which doth containe all the rest within it; and whatsoever is beyond or above that, is the habitation of God and his Angels.

The reason how the Spheres were first found out, were their contrary motions in the Heavens, observed by the ancient learned Astronomers, and we find that by our own observations, as this, viz.

First, all things in the Heavens turne about the earth, upon the Poles of heaven in 24 houres, and these motions are from the East into the West and this wee attribute to the motion of the 10 Sphere, or *Primum mobile*, without staying; being so appointed by God from the beginning, and carrieth about with him in violence all the other Spheres.

All the rest of the Spheres have contrary motions, every one in his kind, though farre slower then the other, and their motions is contrary, from the West to the East, and so are carried about oftentimes by the first mover, before they make one perfect revolution in themselves.

The Christalline or ninth Sphere, his motion is almost unsensible, and is called the Trembling motion, and is performed, according to *Ptolema* his opinion, in 36000 yeares, but by the opinion of others in a farre longer time, as in 49000 yeares.

The eighth Sphere, being the starry firmament, performeth his motion in 7000 yeares.

The rest of the Spheres are the 7 Planets, each sphere containeth in it but one Starre, whereof the uppermost and slowest is *Saturnus*, which performeth his course in 29 yeares, 162 dayes, and 13 houres.

Jupiter performeth his in 11 yeares, 131 dayes, and 13 houres.

Mars performeth his in 322 dayes, and 13 houres.

Sol performeth in 365 dayes and 6 houres, which is one whole yeare complete.

Venus in 395 dayes and 9 houres, performeth her course.

Mercurius performeth it as *Sol*, in 365 dayes, and 6 houres.

Luna performeth her course once every 27 dayes & 8 houres.

THE

THE CHARACTERS OF THE PLANETS.

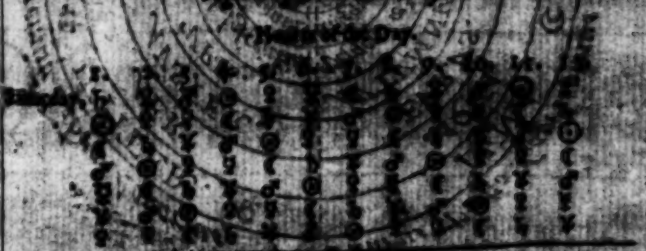
☿ Saturn, ♀ Mars, ♄ Venus, ♃ Jupiter,
 ☼ Sol, ☿ Mercury, ☾ Luna.

There are Points moveable in the Ecliptick, which are called the Dragon-head and the Dragon-tail; and their characters are the Dragon-head and Dragon-tail.

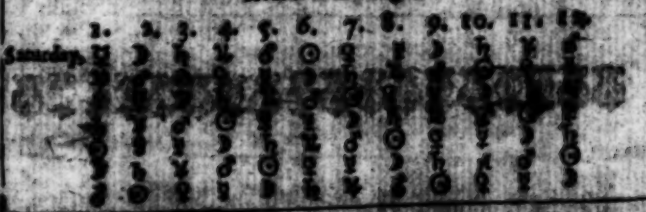
The Dragon-head, is the point in the Ecliptick, which the ☿ touches, when it first crosses the Ecliptick, and which is the Northernmost.

The ☿ is the point in the Ecliptick, where the ☿ crosses it, when it first crosses the Ecliptick, and which is the Southernmost, and these two Points are opposite the one to the other.

To show the Planets in their proper Places at the beginning and ending of the Day.



Hours of the Night.



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